SOLAR/2008-79/06

Monthly Performance Report

ARATEX SERVICES, INC.

JUNE 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT
ARATEX SERVICES, INC.
JUNE 1979

I. SYSTEM DESCRIPTION

The ARATEX Services, Inc. site is an industrial laundry in Fresno, California. The solar energy system is designed to provide approximately 20 percent of the energy to maintain the temperature of the process water at 180°F. It has an array of 140 flat-plate, Lexan-glazed collectors manufactured by Ying Manufacturing Company. They face south at a tilt of 30 degrees from the horizontal. The collectors have a gross area of 6,500 square feet. Water is used as the medium for delivering solar energy from the collector array to storage. The solar heated water is stored in a 12,000-gallon tank. Auxiliary energy is supplied by a low pressure, gas-fired boiler. In addition, a heat exchanger, utilizing energy from a waste water storage tank, preheats the city water input supply. The solar energy system can be isolated from the auxiliary heating system in the event of a malfunction without a reduction in overall system heating capacity.

The system, shown schematically in Figure 1, has three modes of operation.

Mode 1 - Collector-to-Storage: During this mode of operation, water is pumped from the water solar thermal storage through the collectors and back into storage. This mode is entered when the temperature of the collector outlet exceeds the storage temperature by 4.5°F and continues until this differential temperature drops below 1.5°F.

Mode 2 - Hot Water Demand: This mode is entered when there is a demand by the laundry for hot water. City water entering the Domestic Hot Water (DHW) system is preheated using the waste water in the 16,500-gallon holding tank. The temperature of the input city water is raised to approximately 115°F before entering water solar thermal storage. As

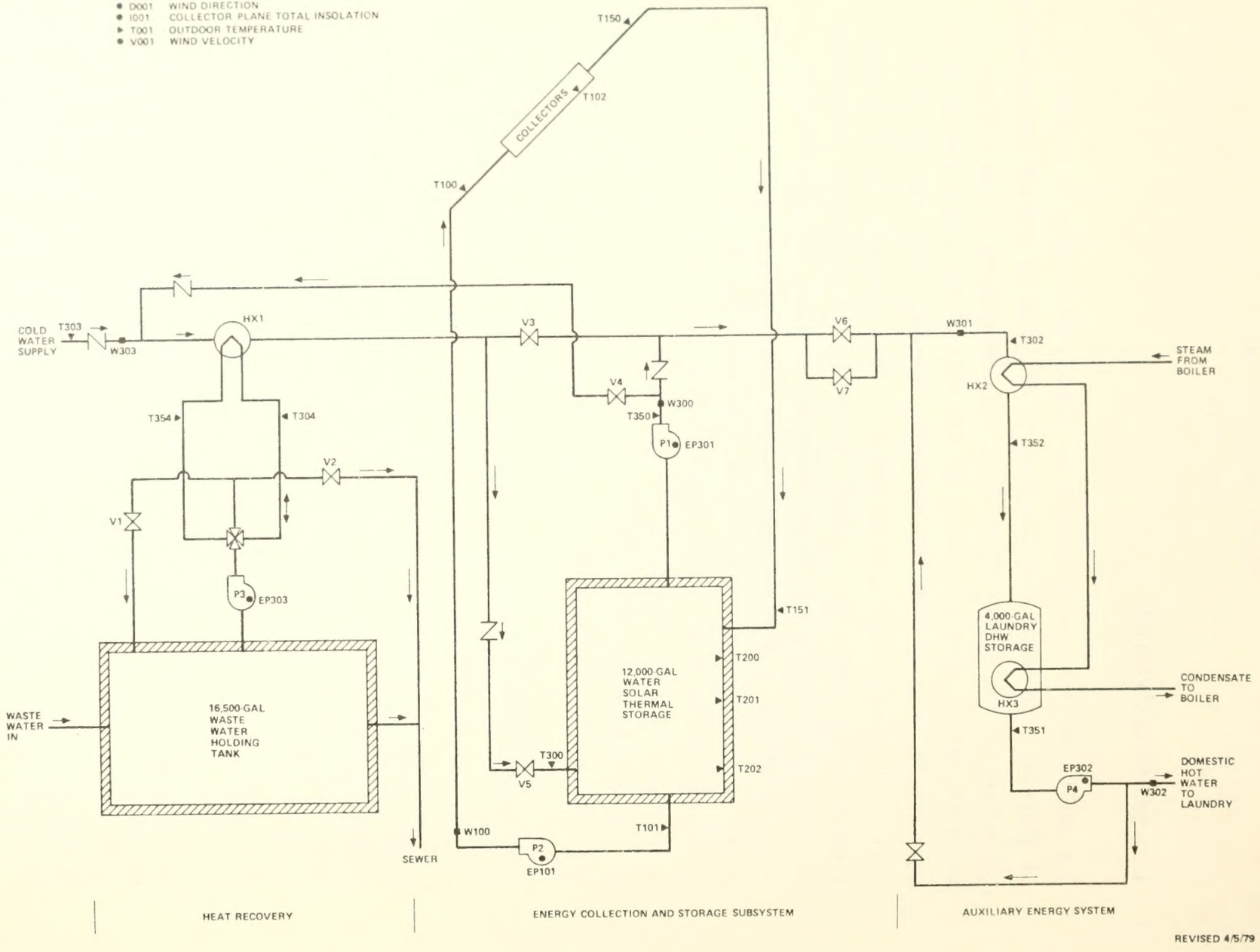

Figure 1. ARATEX SERVICES INC. SOLAR ENERGY SYSTEM SCHEMATIC

water is withdrawn from water solar thermal storage, it passes through steam heat exchanger HX2, where auxiliary energy is added to maintain the 4,000-gallon laundry DHW storage at 180°F. Additional energy is supplied to DHW storage by extracting energy from the condensate line of heat exchanger HX3, as shown in Figure 1.

Mode 3 - Storage-to-Waste Water: When the water in the water solar thermal storage reaches 180°F, it is circulated by reverse flow through heat exchanger HX1, in the heat recovery system, thus storing any excess solar energy in the waste water holding tank. This mode is used to prevent overheating the 12,000-gallon fiberglass storage tank and allows the waste water holding tank to be used as a secondary solar storage tank.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on analysis of the data presented in the attached computer-generated monthly report. The report consists of daily site thermal energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The solar energy system at the ARATEX Services, Inc. site operated continuously during June and satisfied 25 percent of the hot water load. Hot water heating is the only solar-assisted function at this site. The total system load at ARATEX is defined as the sum of the energy supplied by the solar energy system, plus the energy supplied by the auxiliary energy system. The total load was 725.36 million Btu for the month of June.

B. Weather

The Fresno weather has no apparent impact on the energy requirements of the laundry. However, the weather does affect the solar energy collected and used by the laundry. The measured insolation in the plane of the collector array averaged 2,157 Btu/ft^2-day, during June, which is below the long-term average of 2,286 Btu/ft^2-day, as derived from measurements taken from the Fresno Airport.

C. System Thermal Performance

Collector Array - Of the 422.35 million Btu of solar energy incident on the collector array during June, only 322.90 million Btu were incident on the array when the collector loop pump P2 was operating. The system collected 123.02 million Btu, or approximately 29 percent of the total insolation incident on the collector array. The operation of the collector pump required 2.28 million Btu.

Storage - The time-average daily temperatures of storage during June ranged from 126°F to 178°F, resulting in an average daily temperature of 141°F for the month. The calculated value of storage efficiency was 91 percent.

Commercial Hot Water Load - During June, there were 24 working days at ARATEX Laundry. A total of 927,510 gallons of hot water was used, for an average of 38,646 gallons of hot water per work day. The value of 30,917 gallons per day shown in the Hot Water Subsystem section of the computer printout is based on 30 days of consumption, which includes weekends and holidays when the water usage is normally zero.

The city water supply entered the heat recovery system at an average temperature of 76°F and was raised to an average temperature of 112°F by extracting 276.78 million Btu of energy from the waste water holding tank. Solar energy and auxiliary energy were added to raise the process water temperature to an average of 170°F. The resulting total system hot water

load was 725.36 million Btu. Of the 725.36 million Btu total system load, 276.78 million Btu were supplied by the heat recovery system. This reduced the energy requirements on the solar and auxiliary energy subsystems to 448.58 million Btu. Of the 448.58 million Btu, 112.72 million Btu were supplied by the solar energy system. The remaining 335.86 million Btu were supplied by the auxiliary energy system.

D. Observations

It can be observed in the attached computer printout of this report that the solar energy collected is less than the solar energy delivered to storage. This is due to unavoidable loss across the collector during short periods of low incident solar energy collection, while the solar collection pump EP101 is operating. The accumulated loss during June was 4.00 million Btu. Normally the total solar energy collected is computed as a function of W100, T100, and T150, while the energy delivered to storage is computed as a function of W100, T101, and T151. In calculating solar energy collected, using T101 and T151 as opposed to T100 and T150, results in a significant difference in measurement.

Solar energy collected using T101 and T151 was more consistent with changes in storage energy during periods when no energy was being extracted from storage, than was the case when T100 and T150 were used to calculate solar energy collected. These energy imbalances can be caused by relatively small uncertainties in the temperature measurements. This is because of the large mass flow rate through the collector array and the small (approximately 5°F to 7°F) temperature change across the collector array. No instrumentation changes would solve this problem. Therefore, T151 and T101 will be used in computing energy collected for storage, as well as energy delivered from storage.

The total hot water consumed at ARATEX is based on the flow sensor W303 as opposed to W302. When comparing the integrated values of W303, W300, and W302 for the month, the result of using W303 more nearly represents the expected hot water consumption. However, using W303 can be misleading when observing hot water consumption on a daily basis, since filling the tanks will appear as hot water consumption; however, this has little effect on the monthly values.

During the month of June, the total energy required to raise the water from the average inlet temperature of 76°F to an average outlet temperature of 170°F was 725.36 million Btu. This 725.36 million Btu is in comparison to the design load of 1,728.03 million Btu. The difference between the actual hot water load and the design load is due to the difference in actual hot water consumption and the expected consumption when the system was in the design phase.

E. Energy Savings

The equivalent fossil fuel saved by the use of solar energy was 187.87 million Btu at the expense of 2.28 million Btu of electrical energy to operate solar collector pump P2. The heat recovery system supplied 276.78 million Btu of thermal energy to meet the hot water load requirements. Converting this to fossil fuel requirements, the additional fossil fuel savings amount to 461.30 million Btu. The operating expense of the heat recovery system was 1.54 million Btu. The fossil energy savings computations for solar as well as the heat recovery system are based on a comparison of the projected energy requirements of a conventional fossil fuel boiler with an efficiency of 0.60 and the energy requirements of the solar energy system.

III. ACTION STATUS

None.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: ARATEX SERVICES, INC. SOLAR/2008-79/06
REPORT PERIOD: JUNE,1979

SITE/SYSTEM DESCRIPTION:
THIS SITE IS AN INDUSTRIAL LAUNDRY WHICH USES SOLAR ENERGY TO SUPPLY HEAT FOR HOT WATER. IF SUFFICIENT SOLAR ENERGY IS NOT COLLECTED TO SUPPLY THE HEATING REQUIREMENTS FOR HOT WATER, AUXILIARY ENERGY FROM A GAS-FIRED LOW PRESSURE STEAM BOILER IS USED TO MEET THE HEAT NEEDS.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	422.354	MILLION BTU
	64699	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	123.015	MILLION BTU
	18844	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	80	DEGREES F
AVERAGE BUILDING TEMPERATURE	N.A.	DEGREES F
DOSS SOLAR CONVERSION EFFICIENCY	0.27	
DOSS OPERATING ENERGY	2.280	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	15.007	MILLION BTU
TOTAL ENERGY CONSUMED	698.909	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	448.584	N.A.	N.A.	448.584	MILLION BTU
SOLAR FRACTION	25	N.A.	N.A.	25	PERCENT
SOLAR ENERGY USED	112.723	N.A.	N.A.	112.723	MILLION BTU
OPERATING ENERGY	12.727	N.A.	N.A.	15.007	MILLION BTU
AUX. THERMAL ENERGY	335.862	N.A.	N.A.	335.862	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
AUX. FOSSIL FUEL	560.889	N.A.	N.A.	560.889	MILLION BTU
ELECTRICAL SAVINGS	N.A.	N.A.	N.A.	-2.280	MILLION BTU
FOSSIL SAVINGS	187.872	N.A.	N.A.	187.872	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.734

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

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REPORT PERIOD: JUNE,1979

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GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	445.583	GIGA JOULES
	734723	KJ/SQ.M.
COLLECTED SOLAR ENERGY	129.781	GIGA JOULES
	213995	KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	27	DEGREES C
AVERAGE BUILDING TEMPERATURE	N.A.	DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.27	
ECSS OPERATING ENERGY	2.405	GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	15.832	GIGA JOULES
TOTAL ENERGY CONSUMED	737.348	GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	473.256	N.A.	N.A.	473.256	GIGA JOULES
SOLAR FRACTION	25	N.A.	N.A.	25	PERCENT
SOLAR ENERGY USED	118.923	N.A.	N.A.	118.923	GIGA JOULES
OPERATING ENERGY	13.427	N.A.	N.A.	15.832	GIGA JOULES
AUX. THERMAL ENG	354.334	N.A.	N.A.	354.334	GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A.	GIGA JOULES
AUX. FOSSIL FUEL	591.738	N.A.	N.A.	591.738	GIGA JOULES
ELECTRICAL SAVINGS	N.A.	N.A.	N.A.	-2.405	GIGA JOULES
FOSSIL SAVINGS	198.205	N.A.	N.A.	198.205	GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.734

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REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: ARATEX SERVICES, INC.
REPORT PERIOD: JUNE, 1979

SOLAR/2008-79/06

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	14.161	83	4.883	N	0.092	N	0.345
2	14.252	86	0.210	C	0.076	C	0.015
3	14.172	85	0.109	T	0.030	T	0.008
4	15.704	84	9.462		0.100		0.603
5	14.649	84	5.497	A	0.093	A	0.375
6	14.102	84	4.624	P	0.088	P	0.328
7	14.908	78	5.200	P	0.086	P	0.349
8	13.554	79	3.886	L	0.081	L	0.287
9	14.146	83	0.192	I	0.074	I	0.014
10	14.125	86	0.619	C	0.026	C	0.044
11	14.748	89	9.741	A	0.101	A	0.660
12	13.784	88	4.356	B	0.093	B	0.316
13	13.585	82	5.149	L	0.090	L	0.379
14	14.807	74	3.760	E	0.083	E	0.254
15	14.422	73	3.998		0.081		0.277
16	14.296	70	0.491		0.064		0.034
17	14.342	65	0.850		0.024		0.059
18	14.244	70	7.235		0.078		0.508
19	13.982	77	3.553		0.084		0.254
20	13.891	80	4.707		0.089		0.339
21	14.195	78	4.528		0.082		0.319
22	14.141	78	4.267		0.083		0.302
23	13.825	84	0.121		0.070		0.009
24	13.677	86	0.048		0.021		0.003
25	12.460	79	7.137		0.084		0.573
26	14.128	78	4.860		0.087		0.344
27	14.068	82	4.506		0.096		0.320
28	12.185	80	5.053		0.073		0.415
29	13.606	78	3.684		0.086		0.271
30	14.194	76	0.000		0.067		0.000
SUM	422.354	-	112.723	N.A.	2.280	N.A.	-
AVG	14.078	80	3.757	N.A.	0.076	N.A.	0.267
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: ARATEX SERVICES, INC. SOLAR/2008-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	14.161	12.702	5.549	94	0.392
2	14.252	11.199	3.766	100	0.264
3	14.172	4.366	0.853	99	0.060
4	15.704	13.878	5.747	96	0.366
5	14.649	12.992	5.387	92	0.368
6	14.102	12.375	5.029	92	0.357
7	14.908	12.631	5.172	84	0.347
8	13.554	11.759	5.020	*	0.370
9	14.146	11.116	3.542	95	0.250
10	14.125	3.931	0.176	101	0.012
11	14.748	13.395	6.046	100	0.410
12	13.784	12.438	5.537	101	0.402
13	13.585	12.000	5.291	93	0.389
14	14.807	12.466	5.029	83	0.340
15	14.422	12.072	4.839	85	0.336
16	14.296	9.955	2.343	82	0.164
17	14.342	3.969	-0.082	71	-0.006
18	14.244	11.587	4.405	79	0.309
19	13.982	11.936	4.715	88	0.337
20	13.891	12.236	5.034	91	0.362
21	14.195	11.954	5.045	88	0.355
22	14.141	11.970	5.120	88	0.362
23	13.825	10.173	2.921	96	0.211
24	13.677	2.800	0.390	99	0.029
25	12.460	10.310	4.035	89	0.324
26	14.128	12.268	5.231	88	0.370
27	14.068	12.571	5.247	93	0.373
28	12.185	9.930	3.888	92	0.319
29	13.606	11.613	4.590	89	0.337
30	14.194	10.305	3.145	85	0.222
SUM	422.354	322.898	123.015	-	-
AVG	14.078	10.763	4.101	91	0.291
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: ARATEX SERVICES, INC. SOLAR/2008-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	5.549	4.883	0.352	126	0.943
2	3.797	0.210	3.686	150	1.026
3	0.963	0.109	1.073	176	1.228
4	5.747	9.462	-5.750	145	0.646
5	5.669	5.497	0.715	131	1.096
6	5.162	4.624	-0.191	130	0.859
7	5.178	5.200	-0.424	127	0.922
8	5.020	3.886	0.649	130	0.904
9	3.566	0.192	3.208	154	0.954
10	0.795	0.619	0.904	176	1.917
11	6.046	9.741	-4.922	141	0.797
12	5.576	4.356	0.325	130	0.840
13	5.321	5.149	-0.422	128	0.888
14	5.029	3.760	0.468	129	0.841
15	4.896	3.998	-0.242	132	0.767
16	2.833	0.491	3.190	151	1.299
17	0.851	0.850	0.692	170	1.811
18	4.448	7.235	-4.064	139	0.713
19	4.896	3.553	0.838	131	0.897
20	5.113	4.707	-0.371	132	0.848
21	5.049	4.528	0.263	132	0.949
22	5.125	4.267	0.303	134	0.892
23	3.042	0.121	3.273	158	1.116
24	0.438	0.048	0.439	178	1.112
25	4.039	7.137	-4.252	143	0.714
26	5.231	4.860	-0.548	128	0.824
27	5.465	4.506	0.700	129	0.953
28	4.358	5.053	-1.029	128	0.923
29	4.670	3.684	0.924	128	0.987
30	3.145	0.000	3.101	152	0.986
SUM	127.014	112.723	2.890	-	-
AVG	4.234	3.757	0.096	141	0.910
NBS ID	G200	G201	G202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: ARATEX SERVICES, INC.
REPORT PERIOD: JUNE,1979

SOLAR/2008-79/06

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	21.270	23	4.883	0.618	16.387	N	27.367	N	8.138	105	167	39171
2	1.154	18	0.210	0.092	0.944	O	1.576	O	0.350	102	180	2926
3	0.109	100	0.109	0.002	0.000	T	0.000	T	0.182	97	183	0
4	23.918	40	9.462	0.700	14.456		24.142		15.770	111	177	45953
5	18.667	29	5.497	0.631	13.171	A	21.995	A	9.161	115	173	36025
6	19.117	24	4.624	0.595	14.493	P	24.204	P	7.706	115	171	40426
7	20.933	25	5.200	0.603	15.733	P	26.274	P	8.667	113	168	41731
8	19.510	20	3.886	0.624	15.624	L	26.092	L	6.477	113	167	40362
9	0.370	52	0.192	0.045	0.177	I	0.296	I	0.321	91	165	2912
10	0.619	100	0.619	0.002	0.000	C	0.000	C	1.032	77	164	0
11	26.264	37	9.741	0.696	16.523	A	27.593	A	16.235	106	170	55064
12	20.652	21	4.356	0.595	16.296	E	27.215	B	7.260	114	171	43774
13	20.919	25	5.149	0.620	15.771	L	26.337	L	8.581	114	170	43920
14	20.852	18	3.760	0.599	17.092	E	28.544	E	6.266	114	170	44936
15	19.691	20	3.998	0.575	15.693		26.207		6.664	118	169	42917
16	0.491	100	0.491	0.002	0.000		0.000		0.818	132	166	1086
17	0.850	100	0.850	0.002	0.000		0.000		1.417	154	166	0
18	22.996	31	7.235	0.606	15.761		26.321		12.058	121	174	46880
19	20.162	18	3.553	0.559	16.610		27.738		5.921	113	173	43171
20	21.904	21	4.707	0.588	17.197		28.719		7.844	116	170	47675
21	20.545	22	4.528	0.565	16.017		26.748		7.547	117	169	43326
22	18.156	23	4.267	0.548	13.889		23.195		7.111	115	170	36472
23	0.121	100	0.121	0.015	0.000		0.000		0.201	108	168	534
24	0.048	100	0.048	0.002	0.000		0.000		0.080	105	168	0
25	21.715	33	7.137	0.575	14.578		24.345		11.895	112	173	42438
26	22.455	22	4.860	0.614	17.595		29.383		8.100	113	171	44379
27	22.122	20	4.506	0.597	17.616		29.419		7.510	112	172	46033
28	22.684	22	5.053	0.606	17.632		29.445		8.421	117	169	51128
29	20.291	18	3.684	0.549	16.607		27.734		6.140	116	168	43350
30	0.001	0	0.000	0.002	0.001		0.001		0.000	115	167	919
SUM	448.584	-	112.723	12.727	335.862	N.A.	560.889	N.A.	187.872	-	-	927510
AVG	14.953	25	3.757	0.424	11.195	N.A.	18.696	N.A.	6.262	112	170	30917
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: ARATEX SERVICES, INC.
REPORT PERIOD: JUNE,1979

SOLAR/2008-79/06

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	2169	N	83	94	N	103	3
2	2183	O	86	100	O	92	3
3	2171	T	85	99	T	97	5
4	2406		84	96		102	3
5	2244	A	84	92	A	92	3
6	2160	P	84	92	P	99	6
7	2284	P	78	84	P	93	7
8	2076	L	79	*	L	0	1
9	2167	I	83	95	I	0	2
10	2164	C	86	101	C	0	1
11	2259	A	89	100	A	0	2
12	2112	B	88	101	B	*	3
13	2081	L	82	93	L	98	5
14	2268	E	74	83	E	103	6
15	2209		73	85		99	5
16	2190		70	82		93	7
17	2197		65	71		96	8
18	2182		70	79		98	4
19	2142		77	88		0	2
20	2128		80	91		98	4
21	2174		78	88		105	6
22	2166		78	88		97	4
23	2118		84	96		92	3
24	2095		86	99		99	4
25	1909		79	89		101	4
26	2164		78	88		102	6
27	2155		82	93		100	3
28	1867		80	92		102	5
29	2084		78	89		106	7
30	2174		76	85		103	5
SUM	64699	N.A.	-	-	-	-	-
AVG	2157	N.A.	80	91	N.A.	95	4
NBS ID	G001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HEAT RECOVERY SYSTEM

SITE: ARATEX SERVICES, INC. SOLAR/2008-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	HEAT RECOVERY ENERGY(HR) MILLION BTU	SOLAR FRACTION OF HRS ENERGY MILLION BTU	AUXILIARY FRACTION HRS ENERGY MILLION BTU	SUPPLY WATER TEMP DEG F	SOLAR FRACTION OF LOAD PERCENT	HEAT REC SYS OPER ENERGY MILLION BTU
1	10.514	2.606	7.908	75	22.956	0.057
2	0.873	0.177	0.696	73	18.194	0.030
3	0.000	0.000	0.000	73	100.000	0.000
4	13.604	4.663	8.940	77	39.560	0.070
5	10.622	3.055	7.568	76	29.446	0.057
6	12.650	3.023	9.627	75	24.186	0.068
7	11.822	2.991	8.831	75	24.841	0.061
8	11.697	2.318	9.379	75	19.920	0.061
9	0.866	0.786	0.080	74	52.019	0.027
10	0.000	0.000	0.000	74	100.000	0.000
11	16.275	5.450	10.825	77	37.089	0.085
12	13.327	2.971	10.356	76	21.092	0.070
13	12.803	3.206	9.597	75	24.611	0.068
14	13.669	2.498	11.171	76	18.030	0.071
15	13.391	2.804	10.586	76	20.305	0.067
16	0.271	0.191	0.079	76	100.000	0.022
17	0.000	0.000	0.000	77	100.000	0.000
18	13.969	4.153	9.816	76	31.461	0.070
19	13.685	2.437	11.248	75	17.620	0.071
20	14.923	3.182	11.742	75	21.488	0.075
21	12.749	2.847	9.901	76	22.040	0.064
22	10.525	2.268	8.256	76	23.500	0.058
23	0.107	0.000	0.107	80	100.000	0.016
24	0.000	0.000	0.000	81	100.000	0.000
25	11.631	3.734	7.897	79	32.866	0.060
26	12.765	2.807	9.958	75	21.644	0.065
27	13.801	2.788	11.013	75	20.368	0.072
28	16.587	3.451	13.135	76	22.274	0.085
29	13.429	2.431	10.998	75	18.156	0.079
30	0.229	0.000	0.229	79	0.000	0.007
SUM	276.781	66.838	209.943	-	-	1.537
AVG	9.226	2.228	6.998	76	25.129	0.051

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